HoTT FORMALIZATION — REVISION v2

Consciousness as a Topological Region, not a Binary Jump

Revision of Mechanism II (Integration Threshold) based on naturalistic observations

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The Self-Experiencing Universe: A Manifesto for an Emergent Reality (Lis, 2025)
Waldemar Lis (ontology) | Claude / Anthropic (formal analysis) — February 2026
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Why Revision Was Necessary

Formalization v1 assumed that the Integration Threshold (IT) was a **discontinuous phase transition** — analogous to water freezing. This required a new axiom AQE (Axiom of Qualitative Emergence) expressing the irreducibility of consciousness as a jump.

Discussion of naturalistic observations revealed that this assumption was an unnecessary simplification — and that the ontology itself does not require it as a dogma. Nature shows something different:

> **Trees** respond to damage with chemical signals — without neurons. They have integration, a network, something like chemical memory.
>
> **Octopuses** have two thirds of neurons in their arms, not the brain. Consciousness is distributed — there is no single center.
>
> **Honeybee swarms** make decisions that no individual bee makes — intelligence emerges from a network of relations, not from a unit.
>
> **Mycelium** solves optimization problems without a brain, learning through a network of connections spanning kilometers.

Shared conclusion: nature does not build a jump. It builds **increasingly complex networks of relations**, at different levels of which different capacities emerge. Human consciousness is one point on this gradient — advanced, but not categorically different from the rest.

Formal consequence: IT is not a binary threshold but a **region in three-dimensional space** (stability × integration × recursion). This eliminates the need for AQE and changes the entire architecture of Mechanism II formalization.

Mechanism II — Revised: IT as Topological Region

Configuration space and the three gates

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Configuration space: C = Stability × Integration × Recursion
Each configuration κ is a point in C:
  κ = (s(κ), i(κ), r(κ))  ∈  [0,1]³

IT-Region(κ) :≡ s(κ) ≥ s_min  ∧  i(κ) ≥ i_min  ∧  r(κ) ≥ r_min

Depth(κ) :≡ min(s(κ)-s_min, i(κ)-i_min, r(κ)-r_min)

PFC (Proto-Phenomenal Capacity) :≡ ∂(IT-Region)
     = { κ : C | Depth(κ) = 0 }  [boundary of the region]

IP (Integrated Perspective / consciousness) :≡
     Σ(d : ℝ), (d = Depth(κ)) × (d ≥ 0)
     × Vector(s(κ), i(κ), r(κ))
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Key insight: consciousness is defined by the full vector, not just by Depth. Two configurations with identical Depth generate **structurally different** forms of Integrated Perspective — not different levels of the same form.

Why AQE is withdrawn

AQE WITHDRAWN

The Axiom of Qualitative Emergence (AQE) was required only because v1 assumed discontinuity — a jump generating an irreducibly new ontological type. With IT defined as a topological region: IP(κ) is a dependent type that emerges continuously as κ moves deeper into IT-Region. There is no jump to express. AQE is redundant.

Revised Axiom Set: HoTT-RO v2

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HoTT-RO v2 = HoTT + {UA, AFM}

UA  — Univalence Axiom (standard HoTT)
      (A ≃ B) ≃ Id_U(A, B)
      [for Mutual Specification / MS mechanism]

AFM — Axiom of Flat Mutuality (new)
      Π(A B : U_n)(e : A ≃ B),
      MS(A,B) ≃ MS(B,A)
      [symmetry of MS without level restrictions]

AQE — WITHDRAWN
      (redundant with topological IT definition)
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Formalizability Map

Mechanism	Status v1	Change?	Status v2
Mutual Specification (MS)	PARTIAL	→ UNCHANGED	PARTIAL
IT — condition (three gates)	FORMALIZABLE	→ UNCHANGED	FORMALIZABLE
IT — mechanism (discontinuity)	NEW PRIMITIVE (AQE)	✓ CHANGED	FORMALIZABLE — topological region
PFC — Proto-Phenomenal Capacity	(derived from IT)	✓ GAINED	FORMALIZABLE — ∂(IT-Region)
RP — Relational Potential	INHERENT LIMIT	→ UNCHANGED	INHERENT LIMIT
RC — Radical Contextuality	FORMALIZABLE	→ UNCHANGED	FORMALIZABLE

What This Means for the Ontology

One thing is important to state clearly: the inherent limit of Relational Potential (RP) as a pre-categorical condition of possibility is **not a weakness** of the ontology — it is its precise architecture. Every formal system assumes certain rules as given; these rules cannot be expressed within the system itself without regress. This is the Gödelian analogy: a system cannot fully encompass the conditions of its own possibility. HoTT-RO v2 formalizes the manifestations of RP (emerging structures), not RP itself — and this is the correct architectural decision.

References

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